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BOOK REVIEWS

MEDITERRANEAN-TYPE ECOSYSTEMS: THE ROLE OF NUTRIENTS, edited by F. J. Kruger, D. T. Mitchell and J. U. M. Jarvis, with pp. xiii + 552 and 143 figures. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag, 1983. Volume 43 in the series "Ecological Studies". DM 98, approx. US$ 40,50. ISBN 3-540-12158-7.

This is volume 43 in Springer-Verlag's "Ecological Studies" series and is a companion to *Resource Use by Chaparral and Matorral* (1981), edited by P. C. Miller. The volume consists of 27 chapters, each being either the text of a paper or poster presented at an International Congress on Mediterranean Ecosystems held in Stellenbosch in 1980. The text is divided into six sections:

Section I: Evolution and Character of Mediterranean-Type Ecosystems with five chapters,
Section II: Plant Form and Function with four chapters,
Section III: Nutrient Cycling with four chapters,
Section IV: Plant Nutrition with four chapters,
Section V: Community Patterns and Diversity with eight chapters, and
Section VI: Plant-Animal Interactions with two papers. Finally there is an adequate subject index to major topics and each chapter has its own list of references. As such the book generally has a high standard of production and is well bound.

Interest in the ecology of mediterranean-type (MTE's) systems has blossomed in recent years and this book is the sixth that I know of on the subject since 1977. However, this is the first attempt at investigating the rôle of nutrients in determining the structure and functioning of these MTE's. Much controversy still exists in eco-physiological circles of whether water, or nutrients, are most important in determining the structure and function of MTE's. This book goes a long way towards answering this vexed question, which perhaps will never be satisfactorily resolved as both water and nutrients are so intimately linked that their separate rôles may be impossible to totally unravel?

The contents of the volume are reasonably well balanced with attention given to the evolution, function, nutrient cycling and nutrition, patterns of diversity and the rôle of plant-animal interactions in a range of MTE's. As such the book is a necessary addition to libraries, and all students of mediterranean ecosystems and world vegetation. Much of the material is relevant to South African systems, adding a refreshing dimension to available literature on our own ecosystems.

The main disadvantage I see in the volume is that MTE ecologists have again failed to distinguish between what I believe to be two distinct shrubland communities that coincidentally occur in mediterranean climate zones. Both shrublands are essentially evergreen and sclerophyllous, yet one is a heathland and as such not restricted by climate but rather by edaphic factors (Specht, 1979), and the other is the true mediterranean shrubland (di Castri *et al.*, 1981). Until this confusion is resolved the relative rôles of nutrients (and water for that matter) will remain unresolved.

REFERENCES:

DI CASTRI, F., GOODALL, D. W., and SPECHT, R. L., (eds.), 1981. *Ecosystems of the world. Vol. 11. Mediterranean-type shrublands*. Amsterdam: Elsevier.

SPECHT, R. L. (ed.), 1979. *Ecosystems of the world.* Vol. 9A. Heathlands and related shrublands: descriptive studies. Amsterdam: Elsevier.

E. J. MOLL

PROGRESS IN BOTANY 44/FORTSCHRITTE DER BOTANIK 44: MORPHOLOGY, PHYSIOLOGY, GENETICS, TAXONOMY, GEOBOTANY, edited by H. Ellenberg, K. Esser, K. Kubitzki, E. Schnepf and H. Ziegler, with pp. xv + 449 and 39 figures. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag, 1982. DM 168, approx. US$ 67,20. ISBN 3-540-11840-3.

It is a pleasure to be able to review the latest volume of this most excellently produced and valuable series of botanical writings. It comprises 12 sections contributed by an array of distinguished scientists, these sections representing fields as diverse as the stimulating and broad review of general and molecular cytology by A. W. Robards, of carbohydrate metabolism by E. Beck and H. Hopf, and of the systematics and evolution of the algae by M. Melkonian.

The editors, H. Ellenberg, K. Esser, K. Kubitzki, E. Schnepf and H. Ziegler, are to be congratulated on having maintained a uniformly high standard throughout. The result is a book which is much more than a collection of reviews of literature of the past year. For each of the widely disparate topics included, covering virtually the whole of botanical science, an effective synopsis is given of the current state of knowledge, supported by a bibliography of recent relevant literature. It is noticeable that there has been wide sampling of many of the lesser-known European publications.

A relatively minor criticism which may be levied on a few sections is that the English text deviates from normal English stylistic usage. This is particularly apparent in the section "Vegetation Science". It is too obviously translated.

The small number of diagrams and tables are clear and concise and it is a pity that not more were included.

As we have come to expect from Springer-Verlag, the layout is most attractive. One may, however, regret the absence of an author index.

A. R. A. NOEL

PHOTOMORPHOGENESIS, edited by W. Shropshire Jnr., *et al.*, with pp. xxx + 832 and 173 figures. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag, 1983. Volume 16 (parts A and B) in the New Series "Encyclopedia of Plant Physiology (in two parts). DM 338, approx. US$ 131,20. ISBN 3-540-12143-9. Not available separately.

Photomorphogenesis encompasses the regulation of plant growth and development by light. The many growth responses which fall under this title are comprehensively covered in the two volumes by contributors who are experts in their fields. The different chapters were written as autonomous units in which the specific field they cover are dealt with comprehensively. This allows the reader to study each chapter as a unit. The editors allowed the contributing authors freedom to express their own views on the topics under discussion. This resulted in chapters which are not only authoritative but in many instances contain useful guidelines for future research. In some instances conflicting views and interpretations were encouraged. This will ensure that young scientists are exposed to divergent hypotheses prior to embarking on research in this fascinating field of plant physiology.

The two volumes cover the whole field of photomorphogenesis comprehensively and contain 29 chapters. It is not necessary to list these. What is significant is that the topic is adequately defined; attention is given to the pigment systems involved, to phytochrome extraction techniques and phytochrome chromophores; the control of plant growth by light with reference to plant hormones and the role of light in seed germination and flowering. In the second volume the attention given to the significance of phytochrome in nature and horticulture and the chapters on marine macroalgae, ferns and fungi are very pleasing. Lastly the important blue-light effects and UV radiation receive adequate mention. One can only conclude that the information contained in the two volumes of *Photomorphogenesis* will long remain an outstanding guide to plant physiologists and that these books are a must for biological workers in this field.

J. van Staden

Pest Slugs and Snails: Biology and Control, by Dora Godon (translated from the German by S. Gruber), with pp. x + 445 and 47 colour photographs, 125 black and white photographs and drawings. Berlin, Heidelberg, New York: Springer-Verlag, 1983. DM 196, approx. US$ 84,50. ISBN 3-540-11894-2.

This neat and well-produced book reviews the problems caused by gastropods as horticultural and agricultural pests as well as their significance as intermediate hosts for parasites of man and domestic animals. Reference is also made to the role they play as carriers of other diseases which may be transmitted to man or agricultural crops. Mention is also made of the commercial value of some gastropods and information is given on breeding methods.

The first part of the book consists of a thorough though concise treatment of the biology of the gastropods including the physiology, ecology, factors of dispersal as well as a classification and identification key. This part provides a very good background for the inexperienced person who wishes to become acquainted with the gastropods in general and especially with those regarded as pests. It should even be a useful reference work for the more experienced biologist. The illustrations are informative and the colour plates are excellent.

The second part of the book reviews the problems of biological, chemical and non-chemical control and gives an updated account of the available information on this aspect. Although the book was probably primarily aimed at readers in the northern hemisphere, the text fully applies to conditions in southern Africa as most pest molluscs in this region are immigrants from Europe. As such, I regard this book as essential for those interested in doing research with the aim to curb the problem of molluscs regarded as pests in the agricultural, horticultural and medical fields.

The text is so easy to read that the book should make stimulating reading even for the layman. On the other hand it is so informative that students in zoology or biology would benefit from it. The author has here succeeded in bridging the gap so often found between basic and applied research. The references are extensive and up to date. This is a reference work which should be acquired by all biological reference libraries.

W. F. SIRGEL

XYLEM STRUCTURE AND THE ASCENT OF SAP, by M. H. Zimmermann, with pp. x + 143 and 64 figures. Berlin, Heidelberg, New York, Tokyo. Springer-Verlag, 1983. Springer Series in Wood Science. DM 54, approx. US$ 22,30. ISBN 3-350-12268-0.

This is a very readable book by Professor M. H. Zimmermann, of Harvard Forestry School, and senior author of the well-known text *Trees: structure & function*, by M. H. Zimmermann & C. L. Brown. Professor Zimmermann, who is a recognised authority in the field of wood structure and tree physiology, gathers in this book the scattered details concerning xylem structure in a very pleasant and personal manner, and marshals them into order. In this process the implications of these anatomical details upon the physiological process of water translocation emerge very lucidly. He rightly stresses the work of the early botanists whose work is frequently overlooked these days. The story of Hermine von Reichenbach's splendid study on tyloses in 1845 is perhaps the best example of this. Modern workers like Bruno Huber, who contributed so much to our knowledge of vascular physiology, are well presented too.

It is the authors aim to present an "ideas" book in the realm of functional xylem anatomy. In this he has succeeded, as he not only presents factual data but speculates about its implications. He is interested in pointing out what we know and what we don't know. The latter is refreshing.

Although this is quite a short book, it contains a great deal of matter. Hence even a brief review of the details of its contents will not be possible. What I would like to do is make some comments that occurred to me, without any value judgements being involved.

Chapter 1. Conducting units: tracheids and vessels

An excellent chapter with clear interpretations and discussions of the anatomical details. Account of the cinematographic analysis techniques to view entire lengths of vessels. Analytical anatomy to determine the number and size of vessels in wood.

Chapter 2. The vessel network in the stem

The most valuable thing for me in this chapter was the excellent interpretation of the vasculature in arborescent monocotyledons, which makes it much easier to understand this apparently complex anatomy.

The dicotyledons and conifers were well dealt with and some very good experiments presented.

Chapter 3. The cohesion theory of sap ascent

Very good chapter on this topic with good experimental data presented.

There is an important point raised on p. 52 showing some of the reasons why Scholander Bombs can give inaccurate readings at certain times.

Chapter 4. The hydraulic architecture of plants

Very useful chapter, with excellent section on plant segmentation, especially in monocotyledons.

Chapter 5. Other functional adaptations

This is a chapter composed of oddments. The section on the aquatic angiosperms and their water flow was the most interesting, giving much to think about.

Chapter 6. Failure and "senescence" of xylem function

Good chapter on embolism formation, tyloses, gum production and heartwood formation.

Chapter 7. Pathology of the xylem

This was the one chapter that did not really turn out properly. The author admits pathology is not his field, but I agree with him that this matter should be included. Some of the matter discussed such as wetwood was very interesting, but the cohesion of the other chapters was lacking.

This book is ideal for senior undergraduate and postgraduate use. As it deals with xylem structure, and general problems it is quite suitable for South African conditions, although most of the plants chosen have come from moist temperate regions.

With 300 references and 64 figures, this book is well illustrated and authorative. In the references there is a slight lack of consistency, as names with the prefix "von" or "van" may be found under the letter "v" or under the initial letter of the rest of the name.

Finally, the author appeared to be very ill when this book was finished. We hope that his condition was not as serious as he thought and we wish him well.

K. H. SCHÜTTE

PHOTOSYNTHESIS AND PLANT PRODUCTIVITY, edited by H. Metzner, with pp. 340, 142 figures and 60 tables. Stuttgart: Wissenschaftliche Verlags-Gesellschaft mbH, 1983. Paperback DM 32. ISBN 3-8047-0723-8.

This volume contains the reports presented at a joint meeting of the Organization for Economic Cooperation and Development (OECD) and the Studienzentrum Weikersheim, held at Ettlinger Castle from October 11 to 14, 1981. The information contained in the poster sessions has also been included.

In 1981 fifteen countries embarked on a cooperative research project dealing with food production and preservation. The project consists of four subjects, one of which deals with the improvement of photosynthetic efficiency in terms of solar energy used, and the other three with diminishing the waste of energy and agricultural products.

The "photosynthesis efficiency" programme includes 20 research topics grouped into three broad subprogrammes: the study of photosynthesis from the standpoint of the photosynthesising organs, the whole plant and the cultivated field. Although the research was primarily concerned with wheat and maize, some attention was given to other crops such as alfalfa, soybeans, perennial ryegrass, *Euphorbia lathyris*, and others. This book represents a review and evaluation of the results and activities of some 30 laboratories involved in the "photosynthesis efficiency" project.

Following the introduction, three papers deal with the general subject of solar energy conversion and the production of plant biomass. After a discussion by H. Metzner of biological solar energy conversion, J. Fernández, in a paper on photosynthesis and crop productivity, stresses the need of extending areas under cultivation and of finding species with a potential high biomass yield which are adapted to those areas. In the third paper, Klaus Wagener discusses possibilities and constraints in obtaining energy biomass, and points out that although biofuels are at present more costly than comparable fossil fuels, this is expected to change in the foreseeable future.

In the next part, 15 papers summarise the results of *field experiments*. Topics include (among others): production efficiencies of two wheat cultivars during spring growth; leaf characters of wheat in relation to photosynthetic efficiency; protein and chlorophyll content as indicators of senescense in wheat leaves; assessment of maize growth and development in response to irrigation management under subtropical conditions; effects of water stress on photosynthesis and transpiration of *Vitis vinifera*; biomass and protein production of *Portulaca oleracea*; and a preliminary estimate of *Euphorbia lathyris* fuel productivity.

In the section on *studies on whole plants* (16 papers) reports are presented on effects of environmental factors such as temperature, nutrient (N and P) deficiencies, light intensity and water stress on photosynthesis, photorespiration and dark respiration of wheat, maize or soybeans. Some attention was also given to the partitioning of photosynthate in soybeans, a three-compartment model for assimilate transport from maize leaves was proposed, and the effect of cytokinins on pigment accumulation and Hill activity of radish seedlings was studied. In another paper, it is concluded that abscisic acid, depending on its concentration, may influence the transport of sucrose within the plant by affecting sink capacity and/or the unloading of sieve tubes.

Some 21 papers are devoted to studies on plant organs and experiments on the cellular and subcellular level. A wide range of subjects are covered, including: differences in chlorophyll levels, fluorescence, and photosynthetic activity of leaves from high-light and low-light seedlings; effects of benzyladenine on photosynthetic activity of isolated chloroplasts; effects of herbicides such as diuron and bentazon on changes in the thylakoid terpenoid and acyl-lipid composition; ultrastructural effects in chloroplasts, of high and low light intensities, or of NaCl stress, or of different nitrogen sources; and six papers deal with enzyme studies, mainly RuBP-carboxylase, in wheat and maize.

Two papers deal with the mass cultivation of micro-algae. The practicability of using them as a source of protein-rich food is compared to their value as a source of interesting constituents and their possible fermentation to biogas or bioalcohol.

In the final section, seven reports by coordinators on special topics are presented. They are: photosynthesis, respiration and growth (J. P. Gaudillère): water effects on plant growth and development (D. R. Lee); effects of environmental and cultural conditions on the productivity of wheat and maize (T. R. Sinclair); effects of environmental conditions on the mineral demand of plant organs (D. P. Ormrod), or on the general metabolism of sugars, amino acids and organic acids (A. J. Keys), or on photophosphorylation (A. Wild); and enzymic properties of RuBP carboxylase-oxygenase (A. Wild). These are very useful in that they relate the work done in the project to the findings of other researchers in the field. From their comments it is clear that many questions regarding plant productivity in relation to the environment still remain unanswered. Brief reviews on photosynthesis research in the UK and Canada are presented by their national correspondents to OECD.

The book, which is quite modestly priced, is printed by photo-offset on good quality paper. Line drawings, graphs and tables are on the whole adequate, relevant to the text, and generally clearly reproduced. There are not many photographs; with the exception of a few electron micrographs, they are generally clear. Most of the papers cite the relevant literature but in view of the nature and relative brevity of the communications the discussions are generally also brief. The text is in English, with the exception of three diagrams of experimental lay-outs, where the components have been indicated in French. There is a plant index, but unfortunately no subject index.

The book should be of interest mainly to persons engaged in research on plant productivity, but plant physiologists in general, as well as physiological ecologists, should also find it of interest, particularly the three introductory papers and the coordinators' comments.

J. A. de Bruyn

Biology and Ecology of Mangroves, edited by H. J Teas. The Hague: Dr. W. Junk BV Publishers, 1983. Series "Tasks for Vegetation Science" 8. Dfl. 160, approx. US$ 64. ISBN 90-6193-948-8.

This book represents part of the proceedings of the Second International Symposium on the Biology and Management of Mangroves held at Port Moresby, Papua New Guinea, in July 1980. The book comprises 20 chapters, each of which is based on a paper presented at the Symposium.

The first two chapters, which deal with geology, form a sound introduction. The development of mangroves is considered from a geological perspective and evidence is also presented for the existence of a mangrove community in the Upper Carboniferous period.

The following seven chapters deal with the distribution of mangroves in parts of Australia, New Zealand, Papua New Guinea and China. Unfortunately, some of these areas were treated rather superficially, although the information presented is interesting. Generally, the Australian section was covered well and certainly contributes to a greater understanding of zonation in mangrove swamps.

The list of mangrove fishes of New Guinea is useful and is sufficiently detailed to be able to serve as a basis for comparison with other mangrove areas. The survey of faunal communities of Australian mangroves is fairly general. Regrettably relatively little detailed information is available on faunal organisms, especially microfauna, and very correctly the need for faunal studies is stressed if we are to understand relationships between mangroves and animals, especially in the production of detritus from mangrove sources.

As mangrove detritus has been shown to serve as the energy base for estuarine food webs, an understanding of organic matter breakdown and nutrient cycling is essential. Information on this field is provided by articles on the degradation of mangrove stem and leaf tissues under estuarine conditions and on the occurrence of Phycomycetes which degrade cellulose, chitin and keratin.

Miscellaneous topics include albinism in propagules of *Rhizophora mangle*, translocation studies in cryptoviviparous seedlings, and succession in mangrove communities.

The volume concludes with several chapters on the effect of pollution by sewage and oil spills on mangroves. The stresses imposed on these communities by pollution is clear, although the need for more research in this field is stressed. This section should have wide appeal in this country where pollution of estuarine waters is common.

This book has a pleasing appearance. The index is comprehensive and the subject matter is laid out clearly. The text is well illustrated with photographs and diagrams which are of a high standard. Each article carries a list of references which will be useful to workers in those fields.

The book should suit many tastes. It will be invaluable to senior students, teachers and research workers in the field of marine botany and estuarine biology in this country.

T. D. Steinke

Environmental Effects of Off-Road Vehicles: Impacts and Management in Arid Regions, edited by R. H. Webb and H. G. Wilshire, with pp. xxi + 534 and 149 figures. Berlin, Heidelberg, New York: Springer-Verlag, 1983. Springer Series on Environmental Management. DM 132, approx. US$ 52,40. ISBN 3-540-90737-8.

This volume, one in a series of books concerned with the principles and applications of environmental management, serves to provide a clear understanding of the impacts of off-road vehicles on ecosystems and the implications for ORV management.

The rapid escalation of recreational ORV use during the past fifteen years has aroused controversy in many countries. As more ORVs are used in North America than elsewhere in the world, the management recommendations presented in this book are largely derived from studies made in the Californian deserts. Although specifically related to ORV use in arid regions, the information provided in this authoritative book is generally applicable to use modifications of the physical and biological resources of any lands.

Contributions from a number of authors comprise the twenty-three chapters. These are divided into five main categories: physical effects, biological effects, rehabilitation potential, case histories and management concepts and practices.

The physical effects of ORV use are manifest as compaction and disruption of surface soil, destruction and dispersal of surface stabilisers and accelerated wind and water erosion. The natural stability of soils is thus damaged by vehicle use, and recovery from such disturbance is extremely slow.

The impacts on wildlife are also surveyed; because ORVs generate noise, destroy refuges and cause animal death or injury, the effects are pervasive and long-lasting. Studies on the impacts of vehicles on desert vegetation indicate adverse effects due to the direct destruction of plants and soil compaction. Reduction in plant density, cover and species diversity have been documented, and one study observed that "moderate" ORV use reduced the shrub biomass by 50 % and "heavy use" by 70 %.

An "overview" chapter on plant ecology in deserts provides a thorough assessment of the vulnerability of ecosystems to ORV use. The highly consumptive use of land by recreational ORVs critically stresses many ecosystem components, thereby negating attempts at management within the context of sustained yield.

As the subject of plant succession in arid lands has not been well studied, discussions on this phenomenon are largely theoretical. Emphasis is given therefore, to making a distinction between plant "succession" and simple "re-establishment". The lengthy amount of time required for disturbed areas to recover naturally ("which may take centuries") is obviously an important management consideration and is an aspect which is repeatedly stressed by the various contributors.

Artificial reclamation techniques offer a means (albeit expensive) for rehabilitation of vegetation; results to date however, have been disappointing. It is interesting to note that U.S. state and federal rehabilitation laws place a high priority on indigenous plant species for the revegetation of disturbed lands. Reference is made to all known revegetation studies, and procedures for direct seeding and transplanting of container-grown plants are described; the practical difficulties encountered (as grazing by rabbits) are also outlined. The conclusion is drawn however, that even the best revegetation successes will probably not replace the original ecosystems as measured by number of plants or species diversity.

Three primary aspects of ORV use are recognised for management purposes—pleasure for ORV users, conflict with other users and destruction of resources. Each is examined in detail in the final section of this book. Some of the impacts noted in the previous chapters are restated and summarised "for the convenience of the non-scientist who might skip the more technical chapters". The management concepts, practices, regulations and educational techniques discussed reflect a thorough appreciation of the problems associated with ORV use.

Throughout the book, the text is lucid, accurate and exceptionally well referenced. Case histories, field studies and rehabilitation techniques are well described and illustrated with clear diagrams and black and white photographs which are strikingly explicit. Indeed, the vast amount of information contained in this well-compiled volume will be of immense value to all involved in environmental management, and, hopefully, will instil environmental concern in all ORV users.

E. R. Ashton